REMARKS

By the above amendments, claims 1, 3, 5, and 7 are canceled to place this application in condition for allowance. Currently, claims 2, 4, 6, and 8 are before the Examiner for consideration on their merits.

In review, the Examiner rejected claims 1-8 under 35 USC §103(a) based on JP 07310133 to Chuetsu. In making this rejection, the Examiner has set forth a number of points. First, it is alleged that Chuetsu discloses a composition that encompasses that which is claimed. Given this, the Examiner concludes that the specific ranges claimed are obvious variants of the teachings of Chuetsu.

Second, the Examiner asserts that the apparent zinc content is met by the Zn content of Chuetsu.

Third, it is contended, addressing dependent claims 5-8, that defining the source of the material to make the composition does not alter the fact that the composition is suggested by Chuetsu, and that even if it was considered, it is a process limitation that does not affect the composition.

Lastly, it is alleged that the choice of the starting reactants is immaterial to the composition, and, even if considered, does not lend patentable merit to the claims.

In response to the Office Action and rejection, claims 1, 3, 5, and 7 have been canceled, leaving only claims 2, 4, 6, and 8 for consideration by the Examiner. Further, independent claims 2 and 4 are now defined in terms of specifying that phosphorous is a part of the composition, unlike the optional language used in original claims 2 and 4. These claims are also amended to characterize the composition as "consisting

essentially of" as opposed to the original "comprising" language. Other minor changes are made to the claims to address form rather than substance.

Turning back to the rejection, since claims 2 and 4 did not claim phosphorous as a positive alloying element, the Examiner was able to allege that Chuetsu established a *prima facie* case of obviousness. However and when referring to paragraphs [0014] to [0018], it is clear that none of the compositions disclosed therein teach or suggest the invention as now defined in claims 2 and 4.

In Chuetsu, an alloy composition containing copper, tin, bismuth and zinc is found in paragraphs [0015] to [0018]. In paragraph [0015], which corresponds to claim 2 of Chuetsu, zinc, bismuth tin, and at least one of nickel, silicon, aluminum, manganese, and antimony are recited, with the balance copper. No mention of phosphorous is made.

Similarly, paragraph [0016], corresponding to claim 3 of Chuetsu defines a composition with zinc, bismuth tin, and at least one of nickel, silicon, aluminum, manganese, and antimony, and an amount of an alloying element selected from iron, cobalt, titanium, molybdenum, chromium, zirconium, and niobium, with the balance copper.

Paragraph [0017], corresponding to claim 5 of Chuetsu, teaches a composition having zinc, bismuth, tin, and at least one of nickel, silicon, aluminum, manganese, and antimony, with the balance copper.

Paragraph [0018], corresponding to claim 6 of Chuetsu, discloses a composition similar to that of paragraph [0016], but with slightly different percentages.

A key feature running through these paragraphs is the total absence of the element of phosphorous. It should also be noted that Table 2 of Chuetsu does not disclose phosphorous in any alloy. Table 3 discloses phosphorous in Alloy Nos. 15, 16, and 24.

While there is faint mention of phosphorous in Chuetsu, there is no recognition whatsoever of the effect of this element on the copper based alloy.

There are two other deficiencies in Chuetsu that weigh in favor of the patentability of independent claims 2 and 4. There is no mention of apparent Zn content at all. Further, the recognition of the importance of the presence of silicon and the ratio of silicon to tin is also lacking in the teachings of Chuetsu.

With regard to the apparent zinc content, the Examiner asserts that the mere disclosure of a zinc content in Chuetsu meets the claimed limitation of the range of the apparent zinc content. This assumption is incorrect since the actual zinc content and the apparent zinc content are not one in the same. First, the specification on page itself explains that in certain instances an element can enter the α phase or the β phase without forming a third phase. This, in effect, acts as to increase the zinc content, even though additional zinc was not added. Thus, the apparent zinc content can be larger than the actual zinc content.

The apparent zinc content is also important to properties of the alloy. Lower than 39% results in poor hot workability as a result of a reduced β phase proportion. More than 50% results in brittleness. The poor results falling outside these ranges is also illustrated in the discussion of Tables 1 and 2 on pages 10-13 of the specification. Alloys with apparent zinc contents outside the claimed range showed poor results, i.e.,

Comparative Alloy No. 15 and Comparative Alloy No. 11, see Tables 3-5. Therefore, the Examiner cannot conclude, without more, that the apparent zinc content of Chuetsu meets the claimed range. The Examiner is called upon to substantiate any further rejection of the claims in this regard with an objective basis in fact.

Additional arguments in support of the patentability of claims 2 and 4 are made below under their respective headings.

CLAIM 2

In review, claim 2, among other things defines a value of the apparent zinc content, phosphorous, and levels of zinc, bismuth, silicon, tin and copper.

In reviewing the alloys of Chuetsu for relevance, Alloy Nos. 15, 16, and 24 with phosphorous are not relevant to the inquiry of obviousness, since these compositions lack silicon, and are outside the claimed range of tin.

The alloys that may be considered the most relevant from the teachings of Chuetsu are Alloy Nos. 2, 3, 10, 11, 13, and 14. For the Examiner's benefit, a table is provided listing these alloys with the pertinent alloying element amounts, with values outside of the claimed ranges highlighted by bolding and shading.

Alloy No.	Zn	Sn	Bi	Si	Cu (calculated	Si/Sn calculated	Apparent Zn (calc.)
2	36	1.2	0.9	0.9	56.5	0.75	45.6
3	30	0.8	0.8	1.5	60.3	**1.88**	43.5
10	20	2.1	0.6	**1.8**	**69.5**	0.86	**37.8**
11	36	0.6	**3.7**	0.8	**55.3**	**1.33**	44.9
13	30	0.8	1.0	0.8	59.7	1.00	39.9
14	28	0.6	0.7	0.5	63.8	0.83	**34.9**

The following table shows the additional elements for these alloys.

Alloy No.	Ni	Al	Mn	Fe	Co	Zr	Total others
2	0.5	1.5	2.5				4.5
3	1.5	2.8		0.5	1.6		6.4
10		4.6		0.6	0.8		6.0
11		1.0					3.5
13	2.0	4.0	1.0	0.7	1.0		7.7
14		4.3		1.0		1.0	6.3

A first argument is the lack of recognition on the part of Chuetsu as to the criticality of the values of the Si/Sn ratio and apparent zinc content. There is no recognition by Chuetsu that either of these variables as a range of 0.05-1.0 for the Si/Sn ratio and 39-50% range of apparent Zn is a critical variable in performance of the alloy so as to enhance dezincing corrosion resistance.

While Alloy Nos. 2 and 13 contain tin, bismuth and silicon in the claimed ranges, and the Si/Sn ratio and apparent zinc are within the claimed range, the other elements found in the second table are essential as alloying elements and their contents are in a level which affects the properties of the alloy. For example, Alloy No. 2 has 0.5% Ni, 1.5% Al, and 2.5% Mn for a total of 4.5% other elements. Alloy No. 13 has 2.0% Ni, 4.0% Al, 0.7% Fe, and 1.0% Co for a total of 7.7% other elements. These higher alloying element contents change the metallic structure and phase and make the apparent zinc content meaningless. As explained on page 7 of the specification, the apparent zinc content is little changed since the presence of elements that have a great effect, i.e., Ni, Fe, and Al is minimized in the present composition by their minimal content. This difference is reinforced by the presence of the "consisting essentially of" language of claim 2. That is, the addition of excessive amounts of these elements materially alters the properties of the alloy in a harmful way in terms of dezincing

resistance and other properties. But in the Chuetsu Alloy Nos. 2 and 13, the presence of the large amounts of nickel, iron and aluminum results in a different phase structure, even if the apparent zinc content is calculated using the formula of claim 2. Put another way, the actual phases in Chuetsu would not be the same as those found in the invention that minimizes the presence of these undesirable elements. This is further emphasized in the discussion below regarding claim 4, wherein the content of nickel, iron, and aluminum is limited to no more than 0.5%, and the total amount cannot exceed 3.0%.

In the rejection, the Examiner is alleging that since Chuetsu teaches ranges of silicon, bismuth, tin and zinc that overlap or encompass that which is claimed, it obviates the invention. While there may be overlap with respect to ranges of alloying elements, this overlap alone is insufficient to negate the patentability of the invention. Applicant is not claiming a strict alloy composition defined by ranges; the claims have other features including the apparent zinc content and the ratio of silicon to tin. Chuetsu is concerned with the problem of the existence of lead in free machining alloys. To overcome this problem, Chuetsu developed a lead free alloy having zinc, bismuth and tin, see claim 1 thereof and paragraph [0014]. Paragraph [0028] also notes that dezincification is improved by the existence of tin. Antiwear properties can be improved by the addition of additional alloying elements as explained in paragraph [0015].

The present invention approaches the problem of dezincification resistance in an entirely different manner. That is, the present inventors have discovered that improved dezincing resistance is obtained by the presence of silicon and the control of the Si/Sn ratio, the control of the apparent zinc content, and the presence of phosphorous. Claim

2 embodies these three aspects. Chuetsu does not recognize the importance of phosphorous, the importance of the ratio of Si/Sn, or the need to control the apparent zinc content. The criticality of these three factors is demonstrated in the comparative testing set forth in the specification. As shown in Tables 2-5, the comparative alloys lacking one or more of these three characteristics have inferior properties. As importantly, the Examiner should realize that it is not just the presence of zinc, tin, and bismuth which produces resistance to dezincification. Comparative examples Alloy Nos. 12 and 16 each have zinc, tin and bismuth in amounts found within the range of Chuetsu. However, Alloy No. 12, lacking silicon and the wrong apparent zinc content had poor dezincing and mechanical properties. Alloy No. 16 with silicon and tin amounts within the limits suggested by Chuetsu but lacking the claimed Si/Sn ratio had poor forging, cuttability, dezincing resistance and elongation.

This comparative testwork clearly demonstrates that the invention is not merely an obvious variation or adjustment of the percentage ranges of the alloying elements of Chuetsu, but one that provides results unexpected in the prior art. Chuetsu does not suggest that control of phosphorous, the Si/Sn ratio, or the apparent zinc content improves dezincing resistance. These unexpected results effectively rebut any allegation that Chuetsu establishes a *prima facie* case of obviousness against claim 2.

CLAIM 4

Claim 4 is patentable for the same reasons set forth above for claim 2. In addition, and referring to the closest alloys of Chuetsu again as listed in the two tables above, the limits of Al, Mn, Fe, Ni, Co of claim 4 are outside the ranges found in these alloys. More specifically, Alloy No. 2 of Chuetsu has aluminum and manganese outside

the ranges specified in claim 4. Alloy No. 3 has nickel, aluminum, and cobalt outside the claimed ranges. Alloy No. 10 has aluminum, iron and cobalt outside the claimed ranges. Alloy No. 11 has aluminum and manganese outside the claimed ranges. Alloy No. 13 has nickel, aluminum, iron, and cobalt outside the claimed ranges. Alloy No. 14 has aluminum, iron, and zirconium outside the claimed ranges.

As mentioned above and on page 7 of the specification, by limiting the presence of the elements of nickel, aluminum, manganese, iron, and zirconium to between 0.1 and 0.5% and with a total amount of other elements not exceeding 3.0% as claimed, the apparent zinc content is unaffected, and the effect of these elements on the properties of the alloy is minimized, especially any adverse effect on dezincing resistance. No recognition of these limits are found in Chuetsu, and this reference does not establish a *prima facie* case of obviousness against claim 4 for this reason alone.

SUMMARY

By the arguments set forth above, claims 2 and 4 are patentably distinguishable over Chuetsu on the grounds that the claimed limitations of phosphorous content, the presence of silicon and the ratio of silicon to tin, and the range of apparent zinc content are not obvious variants of Chuetsu, and no *prima facie* case of obviousness is established. Alternatively, these features produce unexpected results in terms of dezincing resistance, elongation, cuttability, and mechanical properties, and any *prima facie* case of obviousness is effectively rebutted. For either or both of these reasons, claims 2 and 4 are in condition for allowance. Dependent claims 6 and 8 are in condition for allowance by reason of their dependency on claims 2 and 4, respectively.

Accordingly, the Examiner is respectfully requested to examine this application in light of this amendment, and pass all claims onto issuance.

If the Examiner believes that an interview with Applicants' attorney would be helpful in expediting allowance of this application, the Examiner is respectfully requested to telephone the undersigned at 202-835-1753.

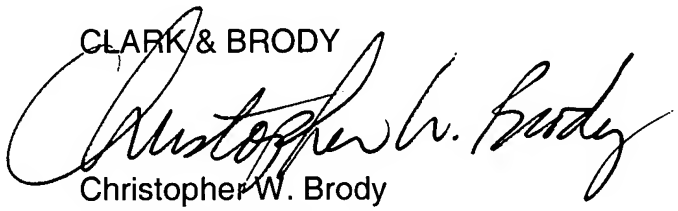
The above constitutes a complete response to all issues raised in the Office Action dated June 15, 2004.

Again, reconsideration and allowance of this application is respectfully requested.

A petition for a two month extension of time is hereby made. Attached herewith is a check in the amount of $430.00 to cover the cost of the extension. Please charge any fee deficiency or credit any overpayment to Deposit Account No. 50-1088.

Respectfully submitted,

CLARK & BRODY



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